Amendments To The Drawings:

Attached please find six sheets of formal drawings, for Figures 1-6. Please note that in Figure 6, the clutch bearing is indicated by numeral 102. Reference numeral 94, mentioned in ¶2 of the office action, has been amended in the specification to 102. The formal drawings are believed to overcome the objections in ¶'s 1-3 of the office action.

Remarks

This Amendment is in response to the Office Action dated **November 3, 2005.** The Examiner objected to the drawings in ¶'s 1-3 of the office action. The Examiner rejected claims 4, 10, 11, 12, 13, 14, 18 and 19 under §112. The Examiner rejected claims 1-5, 8-11 and 13 under §102(b), as being anticipated by Blanchette US 4051923. The Examiner rejected claims 6, 7, 20, 21 and 24 as obvious over Blanchette in view of Lin US 6755283. The Examiner rejected claims 13 and 14 as obvious over Blanchette. The Examiner rejected claims 15 and 16 (and it appears also claims 22, and 23) on the claim 14 combination, further in view of Paterson US 5803437. It appears the Examiner also rejected claims 17-19 on the claim 16 combination, further in view of Strong US 6616567.

Objections To The Drawings

In response, applicants have filed formal drawings, in which the clutch bearing of Figure 6 is indicated by reference numeral 102. The reference numeral 94 is not used in any of the drawings. Applicant also amended the specification on page 10, line 31, to replace reference numeral 94 with 102, to conform to the Figures. No new matter has been introduced. These amendments are believed to overcome the objections in ¶'2 1-3 of the office action.

§112 Rejections

Claim 11 has been amended by replacing "linear drive" with "lift drive".

Claim 4 has been amended to address the Examiner's objection in paragraph 7 of the Office Action by clarifying that at least one spiral drive thread engages two teeth on the rack at once. This claim should be allowable as the further limitation is that the spiral thread is continuous and the same thread engages at least two teeth on the rack at once.

Claim 13 has been amended to address the Examiner's objection in paragraph 11

by indicating that the combination of materials selected for the spiral drive element and teeth is done with the view of ensuring the coefficient of friction is low.

The §112 indefiniteness rejections to claims 11, 12, 18, 19 in ¶'s 9-10 and 13-14 of the office action are respectfully traversed. One of ordinary skill in the art would understand the subject matter as claimed in these claims.

Claim 10 would be clear to a person skilled in the art. A person skilled in the art would understand that the speed of the carriage along the rack is determined by the speed of rotation of the motor and the pitch of the threads of the spiral drive element. Moreover this feature is described on page 7, lines 14 to 25 of the written description.

In claim 11, the expression "reasonable factor of safety" is understandable to one skilled in the art. As an example, if a track tooth is intended to withstand design loads of 50 pounds, but incorporates a factor of safety of 1.5, then the track tooth is designed to withstand a load of 75 pounds, although it is intended to withstand loads of 50 pounds and less.

Similarly, with regard to claims 18-19, one of ordinary skill in the art would understand how efficiency of the gear box and spiral drive are calculated.

§102 and §103 Rejections

Independent claim 1 has been amended to overcome the §102 rejection of ¶16 of the office action, and independent claim 20 has been amended to overcome the §103 rejection of ¶30 of the office action.

Claim 1 has been amended to restrict the material for the spiral drive element and rack to plastic, and also to incorporate the limitation of claim 5, namely, a movable carriage having wheels. Accordingly claims 5 and 15 have been cancelled. Claim 1 has also been amended by including the feature that the base of the rack has a reinforcement. Support for the

reinforcement feature is found at page 9, lines 8-19.

Claim 20 has been similarly amended, and claim 22 has been amended to include the feature that the rack and spiral drive element are made from different types of plastic. Support for claim 22 is found at page 8, line 30 to page 9, line 4, where it is stated that in a preferred embodiment the track is made from nylon6/6, and the worm is made from Nylatron or Nylube.

The claims, as presently amended, are neither anticipated nor obvious in view of the prior art cited by the Examiner, for the reasons that follow.

In general, the present invention is directed to a lift drive suitable for example in a stair lift device of the type that is used to move loads (goods or people) short distances up and down stairs. Specifically, the present invention relates to a drive device of the sort that may be used in stair lifts or elevators for use by mobility challenged people.

A key aspect of the present invention is that mechanical movement of a load is accomplished by a drive device propelling itself (and the load) along a linear track (a rack). The invention utilizes a stationary plastic, having a plurality of teeth disposed on its surface, along its length. The plastic rack is reinforced by a reinforcing element. As explained in the specification, the reinforcing element is required to limit the deformation of the rack, under load (i.e. to provide dimensional stability), which deformation could result in an unequal distribution of load amongst the teeth engaging the drive element.

The rack is typically secured to a supporting structure, such as stairs or walls. The drive device is mounted to the rack, and moves the load along the stationary rack by rotating a worm (a plastic spiral drive element), which engages complementary teeth on the plastic rack. It is worth noting that in some prior art configurations of stair lifts, the drive device rides along a rack by engaging the rack with a toothed wheel, as opposed to a worm according to the present

invention. In such prior configurations only one tooth of the rack is fully engaged at any time by one tooth of the toothed wheel. Such a configuration creates high stress in the tooth (since substantially all of the load is carried by the tooth) and therefore prohibits the use of plastic.

In the present invention, five or more teeth of the rack are engaged at any one time by the threads of the worm (see Fig. 3 of the specification). This ensures that the weight of the drive device and load is equally divided among the engaged teeth, and therefore any one tooth carries only a fraction of the overall weight being supported by the worm. For example, in an embodiment of the present invention having a worm engaging 5 teeth of the rack, each tooth on the rack must carry only 1/5th the entire weight. In this way the applicant has found a way to make both the rack and the spiral drive element out of plastic.

For this to be true, the teeth must be precisely positioned relative to the spiral drive thread (so the load is carried equally). Precise positioning requires dimensional stability, which plastic alone cannot deliver. The applicant was the first to recognize that the benefits of lightweight plastic could be obtained from a reinforced track element which is dimensionally stable.

The benefits of the applicant's traveling worm device in combination with a stationary toothed rack include:

- the ability to use lighter, less durable, and less expensive materials for the rack and drive device, such as plastics;
- the ability to use a less powerful motor for further cost savings; and
- the ability to design a less cumbersome and thus more easy to install lift device.

In view of the above, it is respectfully submitted that none of the cited prior art documents can, in combination, or otherwise, be said to render the present invention anticipated

or obvious, since as yet no one else has used a plastic worm (i.e. a spiral drive element) in a drive device to move itself and a load along a fixed plastic track.

The Examiner states that Peterson et al teaches a spiral drive element and teeth made from plastic. However, this patent teaches the use of a worm to rotate a toothed wheel to wind and unwind a cable, which is not the mechanical equivalent of using a plastic worm to translate the position of the worm drive device along a reinforced plastic rack. This patent teaches a different solution to a different problem. Accordingly, a person skilled in the art would not look to the teachings of this patent in developing the present invention. In any event, even if it does teach use of plastic, there is no teaching of reinforcing the plastic to be dimensionally stable.

As stated above, the use of plastic material for a worm and toothed wheel configuration has, in the past, been deemed not suitable for translating loads such as people as plastic does not have the required strength and durability. The potential for a catastrophic failure of a device for moving disabled persons mitigates against the use of plastic. Accordingly, it is respectfully submitted that an obviousness objection on the basis of the Paterson et al. reference in combination with any of the cited prior art cannot be sustained in light of the amended claims.

It is further submitted that neither *Blanchette et al* nor *Lin*, individually or in combination, disclose each and every feature of the present invention, as claimed, and in fact teach away from the present invention as explained in detail below.

The claims, as amended, define a lift drive device having a plastic spiral drive element, a plastic rack having a reinforcing element at its base and a movable carriage. The motor for rotating the spiral drive element and the spiral drive element are mounted onto the carriage.

Blanchette et al is directed to a cableless cage elevator which propels itself along a pair of tube-like structures 1, having internal threads 5, which are engaged by a spiral drive element 17. A channel extending through the length of the tube provides the means for linking a motor on the elevator to the spiral drive elements in the tube-like structures, to convert rotational movement of the motor and spiral drive elements into a linear movement of the elevator. The outside of the tube-like structure has guide ridges 8 along its length, and the elevator has a pair of legs 14 straddling the tube-like structure and engaging the guide ridges with matching notches in the legs.

The tube-like structures of *Blanchette et al* are structurally different from the rack of the present invention. As the examiner has noted, *Blanchette et al* is silent on whether the tube-like structures containing internal threads are made of plastic and thus the Examiner has relied on the notional combination with Patterson. However, in neither of the two references is there teaching of providing a reinforcing element, as now claimed in independent claims 1 and 20 as amended, as well as new independent claims 38, 39 and 40, to prevent undue deformation of the plastic rack under load.

Moreover, the tube-like structures of *Blanchette et al*, are not analogous to the plastic rack of the present invention. The tube-like structures disclosed in *Blanchette et al* have a C- shaped cross-section. This is disadvantageous in that it results in a heavier, costlier and more complicated track. More importantly, however, the tube-like structures of *Blanchette et al* have internal threads, which cannot be characterized as a rack having a base and a plurality of teeth extending from the base, as now claimed. The internal threads of *Blanchette et al* create increased contact area with the spiral drive element, resulting in increased friction, thereby rendering the device less efficient. Also, the fact that in *Blanchette et al*, the spiral drive element

is enclosed in the tube-like structure means that it is difficult to replace or service if it becomes worn, whereas, in the present invention removal of individual track elements from the rack is not a problem. Accordingly, it is respectfully submitted that *Blanchette et al* does not teach a plastic rack as described and claimed in the present application. Turning now to *Lin*, it is submitted *Lin* does not teach a plastic rack having a base and a plurality of teeth extending from the base. *Lin* teaches a complicated support structure comprising individual "interlocking wheel 130" mounted to cross-members (fixed track 130), which are attached to vertical supporting brackets 151. The whole thing then appears to be enveloped by guide bracket 150. The individual load bearing elements of *Lin* are rotating pulleys, and multiple fixed tracks 130 are required (see column 5, line 64). This is quite different than the single row of fixed teeth the applicant has claimed.

The carriage of the present invention is also structurally different from the one in *Blanchette et al* in that the carriage of the present invention has wheels. As noted by the Examiner, *Blanchette et al* is silent concerning a carriage having wheels. Although, the Examiner has stated that *Lin* teaches a carriage which includes a plurality of wheels, it is respectfully submitted that *Lin* does not teach a carriage having wheels, but instead, teaches slide-bars or ball bearings (see Col. 5, lines 21 and 22). Ball bearings are not wheels, and are defined as "[a] friction-reducing bearing consisting essentially of a ring-shaped track containing freely revolving hard metal balls against which a rotating shaft or other part turns", in Dictionary.com's on-line dictionary.

In any event, it is believed that the notional combination of *Blanchette et al* with *Lin* to arrive at a carriage having wheels is improper, on the basis that a person skilled in the art would not be motivated to make such a combination. *Lin* requires a mechanism to maintain the spiral drive element in close interlocking cooperation with the "interlocking wheels 140" during

lifting (Col. 5, 16-1 22), and accomplishes this with a location limiting bracket 110 and slide-bars or ball-bearings Ill which slide along the guide bracket 150.

However, in Blanchette at al the tube-like structures have a C-shaped cross-section to contain the spiral drive element. Therefore, any lateral movement of the elevator is restricted by the tube-like structures themselves, while the notched legs 14 straddling the tube-like structures act to guide the elevator cage 2. Since the spiral drive element is contained in the tube-like structures, the notched legs are not required to ensure contact with the internal threads of the tube-like structures is maintained, and thus the combination is improper. The only motivation would appear to be the applicant's specification.

Accordingly, it is respectfully submitted that a person skilled in the art, knowing *Blanchette et al*, would not be motivated to combine the teachings of slide-bars or ball bearings, so as to add them to the notched legs 14 of Blanchette et at, let alone, take the further inventive step of replacing the slide-bars or ball bearings and replace them with wheels.

According to the present invention, good contact is ensured between the spiral drive element and the teeth of the rack, by restricting lateral movement by utilizing a movable carriage which secures the motor and spiral drive element to the rack. Since the lateral movement is restricted by the carriage, and not the rack, it is possible to move away from the C-shaped configuration of the *Blanchette et al* tube-like structures for restricting lateral movement, and their inherent disadvantages.

In view of the above, it is respectfully submitted that a person skilled in the art would not be motivated to combine *Blanchette et al* and *Lin* to arrive at the present invention which has a wheeled carriage, without the teachings of the applicant's present disclosure. Moreover, the notional combination of *Blanchette et al* and *Lin* would not result in the present

invention, which includes a wheeled carriage.

Finally, it is respectfully submitted that both *Blanchette et al* and *Lin* teach directly away from the present invention, as now claimed. *Blanchette et al* requires at least two tube-like structures to operate. This is made clear at Col. 1, Lines 60-63, where it is stated that the cage elevator "includes a pair of laterally spaced-apart and internally threaded upright cylinders 1 ." That this feature is essential may be inferred from the language of claim 1, where a cableless elevator system "comprising a pair of laterally spaced-apart upright channels.. .a series of hollow cylindrical sections removably fitted with each channel" is claimed.

Similarly, *Lin* teaches a two or three rail configuration. At Col 6, Lines 9-13 it is stated that "[t]here shall be at least one spiral lifting wheel 120, which will be interlocked with the interlocking wheels 140 on both sides of the fixing track 130 on the two sides of the compartment 180." Compartment 180 is the elevator. Then later at Col. 6, Lines 15-16, it is stated that in general "2 or 3 spiral-lifting wheels 120 are needed, and each is independently interlocked with its corresponding interlocking wheel 140."

Contrary, to the teachings of both *Blanchette et al* and *Lin*, the lift drive device of the present invention is designed to function with a single rack. Accordingly, it is respectfully submitted that this feature is unobvious in light of the direct teachings by *Blanchette et al* and *Lin* that more than one rack are required.

In view of the foregoing comments, it is respectfully submitted that independent claims I and 20 as amended, as well as new independent claims 38, 39 and 40, are novel and unobvious in view of both Blanchette et a!. and *Lin*, since neither disclose the following elements:

- a single rack

- a rack made from plastic,
- a spiral drive element made from plastic,
- a rack having a base and a plurality of teeth extending from the base,
- a reinforcing element on the base, and
- a movable carriage having wheels.

New Claims

Applicant has also added new claims 25 to 41 to further define the invention. New claim 25 further defines the gear box reduction, and support for this claim may be found at page 10, lines 1 to 3.

New claims 26 to 32 define a safety brake. Support for this feature is found at page 10, line 26 to page 11, line 21, and Figure 6.

New claims 33 to 37 define the track sections. Support for this feature is found at page 9 lines 5 to 27.

New claims 38 to 41 define devices for moving loads and are supported throughout the written description.

New Art

Applicant is submitting an IDS with this amendment. The claims as amended are believed to distinguish over the cited art.

Conclusion

Claims 1-4, 6-14 and 16-41 remain in the application, and as presently amended, are believed to be in condition for allowance.

Respectfully submitted,

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